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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/566,301	01/25/2006	Shiro Tsukamoto	OGOSH41USA	2012

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HOWSON & HOWSON LLP
501 OFFICE CENTER DRIVE
SUITE 210
FORT WASHINGTON, PA 19034

EXAMINER	
BERMAN, JASON	

ART UNIT	PAPER NUMBER
1795	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docketing@howsonandhowson.com

Office Action Summary	Application No.	Applicant(s)	
	10/566,301	TSUKAMOTO, SHIRO	
	Examiner	Art Unit	
	Jason M. Berman	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 May 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,7,9,11-13,16-18,22,24 and 27-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,7, 9, 11-13, 16-18, 22, 24, 27-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of the Claims

Claims 1,7, 9, 11-13, 16-18, 22, 24, 27-32 are pending in the current application.

Response to Amendment

Applicant's amendment of 5/3/10 does not render the application allowable.

Status of the Rejections

All rejections from the previous office action are maintained.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1, 9, 22 and 27-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Subramani (US 2004/0222088) in view of Pavate (US 6,139,701). Additional evidence is provided by Hurwitt (US 5,632,869).

As to claim 1, Subramani discloses a hollow cathode sputtering target comprising an inner bottom face (figure 1: target face 5) that forms a non-erosion portion of the hollow sputtering target and a cylindrical inner peripheral face (figure 1A: target face 6) that forms an erosion portion of the hollow cathode target. Subramani also discloses the machining to provide a smooth target surface (paragraph 34).

Subramani is silent as to the roughness of the inner bottom face and inner peripheral face being less than 1.0 um.

Pavate discloses a sputtering target in which a smooth surface with less than 5 micro inches [0.13 um] to prevent field enhanced 'splat' formation during deposition (col 8 lines 40-48).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide a smooth target surface, as disclosed by Pavate, in the apparatus of Subramani, because smooth target surfaces prevents magnetic field deviations and splat formations (Pavate at col 8 lines 40-48).

As to the limitation of the properties being present upon manufacture, the method of forming the device is not germane to the issue of patentability of the device itself. Therefore, this limitation has not been given patentable weight.

As to the limitation of "plastic-worked", the method of forming the device is not germane to the issue of patentability of the device itself. Therefore, this limitation has not been given patentable weight.

As to claim 9, Pavate discloses the surface roughness is less than 0.5 um (col 8 lines 40-48: 5 micro inches [0.13 um]).

As to claim 22, Subramani discloses the target is formed from a cladding material (claim 2: materials to form sputtering surface).

As to claim 27, Subramani discloses a sputtering target comprising:

- A cup-shaped body having an inner peripheral surface defining a hollow cavity (Figure 1A: sputtering target with inner peripheral surface 4 and 6);
- Within the cup shaped body and an outer peripheral surface on a exterior of said body, said inner peripheral surface being a sputtering face of the cup shaped body and the outer peripheral surface being a non-erosion face (figure 1A: showing inner surface 4 and 6 for sputtering, and opposing (unlabeled) outer surface not exposed to plasma sputtering);
- The inner peripheral face being a cylindrical peripheral face (paragraph 21: cylindrical sidewalls) and a bottom face (figure 1A: face 5);
- A curved face defining a boundary between the cylindrical face and the bottom face (figure 1A: showing curved transition between areas 5 and 4 or 6); and
- The cylindrical peripheral face forming an erosion area of the sputtering face (figure 1A: faces 4 and 6 exposed for sputtering);

- The bottom face forming a non-erosion portion (figure 1B: showing field generation to direct plasma at sidewall faces).

Subramani, while disclosing the machining to provide a smooth target surface (paragraph 34), is silent as to the roughness of the inner bottom face and inner peripheral face being less than 1.0 um.

Pavate discloses a sputtering target in which a smooth surface with less than 5 micro inches [0.13 um] to prevent field enhanced 'splat' formation during deposition (col 8 lines 40-48).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide a smooth target surface, as disclosed by Pavate, in the apparatus of Subramani, because smooth target surfaces prevents magnetic field deviations and splat formations (Pavate at col 8 lines 40-48).

It should be noted that Subramani in view of Pavate discloses a polished target in which the entire target has an equally low surface roughness before use. However, it would be inherent that during any subsequent sputtering operation the sputtering surfaces of the target would be physically roughened by the physical removal of particles of target material which occurs during sputtering, as evidenced by Hurwitt (col 3 lines 53-55: sputtering by plasma roughens target surface; col 6 lines 59-64: roughening of target inherent during sputtering process; abstract: target inherently roughened by sputtering process). Therefore, the target of Subramani in view of Pavate will inherently have a surface roughness of the inner bottom face be less than the

roughness of the cylindrical peripheral space once the peripheral face is used for sputtering.

As to claim 28, Pavate discloses the surface roughness is less than 0.5 um (col 8 lines 40-48: 5 micro inches [0.13 um]).

As to claim 29 and 30, Subramani discloses the target is formed from Ti or Ta (claim 2: materials to form sputtering surface).

As to claim 31, Subramani in view of Pavate discloses a polished target in which the entire target has an equally low surface roughness before use. However, it would be inherent that during any subsequent sputtering operation the sputtering surfaces of the target would be physically roughened by the physical removal of particles of target material which occurs during sputtering, as evidenced by Hurwitt (col 3 lines 53-55: sputtering by plasma roughens target surface; col 6 lines 59-64: roughening of target inherent during sputtering process; abstract: target inherently roughened by sputtering process). Therefore, the target of Subramani in view of Pavate will inherently have a surface roughness of the inner bottom face be less than the roughness of the cylindrical peripheral space once the peripheral face is used for sputtering.

4. Claims 1, 9, 22 and 27-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Subramani in view of Yamakoshi (US 6,153,315). Additional evidence is provided by Hurwitt (US 5,632,869).

As to claim 1, Subramani discloses a hollow cathode sputtering target comprising an inner bottom face (figure 1: target face 5) that forms a non-erosion portion of the

hollow sputtering target and a cylindrical inner peripheral face (figure 1A: target face 6) that forms an erosion portion of the hollow cathode target. Subramani also discloses the machining to provide a smooth target surface (paragraph 34).

Subramani is silent as to the roughness of the inner bottom face and inner peripheral face being less than 1.0 um.

Yamakoshi discloses a sputtering target in which the surface is machined to create a surface roughness below 0.2 um (col 4 lines 15-17 and claim 2) to prevent nodule formation.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide a smooth target surface, as disclosed by Yamakoshi, in the apparatus of Subramani, because this prevents nodule formation (Yamakoshi at col 4 lines 15-17 and claim 2).

As to the limitation of "plastic-worked", the method of forming the device is not germane to the issue of patentability of the device itself. Therefore, this limitation has not been given patentable weight.

As to claim 9, Yamakoshi discloses the surface roughness is less than 0.5 um (claim 2: 0.2 um roughness).

As to claim 22, Yamakoshi discloses the sputtering target is formed from a cladding material (col 15 lines 45: Ti, Ta, etc target).

As to claim 27, Subramani discloses a sputtering target comprising:

- A cup-shaped body having an inner peripheral surface defining a hollow cavity (Figure 1A: sputtering target with inner peripheral surface 4 and 6);

- Within the cup shaped body and an outer peripheral surface on a exterior of said body, said inner peripheral surface being a sputtering face of the cup shaped body and the outer peripheral surface being a non-erosion face (figure 1A: showing inner surface 4 and 6 for sputtering, and opposing (unlabeled) outer surface not exposed to plasma sputtering);
- The inner peripheral face being a cylindrical peripheral face (paragraph 21: cylindrical sidewalls) and a bottom face (figure 1A: face 5);
- A curved face defining a boundary between the cylindrical face and the bottom face (figure 1A: showing curved transition between areas 5 and 4 or 6); and
- The cylindrical peripheral face forming an erosion area of the sputtering face (figure 1A: faces 4 and 6 exposed for sputtering);
- The bottom face forming a non-erosion portion (figure 1B: showing field generation to direct plasma at sidewall faces).

Subramani, while disclosing the machining to provide a smooth target surface (paragraph 34), is silent as to the roughness of the inner bottom face and inner peripheral face being less than 1.0 um.

Yamakoshi discloses a sputtering target in which the surface is machined to create a surface roughness below 0.2 um (col 4 lines 15-17 and claim 2) to prevent nodule formation.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide a smooth target surface, as disclosed by Yamakoshi, in

the apparatus of Subramani, because this prevents nodule formation (Yamakoshi at col 4 lines 15-17 and claim 2).

It should be noted that Subramani in view of Yamakoshi discloses a polished target in which the entire target has an equally low surface roughness before use. However, it would be inherent that during any subsequent sputtering operation the sputtering surfaces of the target would be physically roughened by the physical removal of particles of target material which occurs during sputtering, as evidenced by Hurwitt (col 3 lines 53-55: sputtering by plasma roughens target surface; col 6 lines 59-64: roughening of target inherent during sputtering process; abstract: target inherently roughened by sputtering process). Therefore, the target of Subramani in view of Yamakoshi will inherently have a surface roughness of the inner bottom face be less than the roughness of the cylindrical peripheral space once the peripheral face is used for sputtering.

As to claim 28, Yamakoshi discloses the surface roughness is less than 0.5 um (claim 2).

As to claim 29 and 30, Subramani discloses the target is formed from Ti or Ta (claim 2: materials to form sputtering surface).

As to claim 31, Subramani in view of Yamakoshi discloses a polished target in which the entire target has an equally low surface roughness before use. However, it would be inherent that during any subsequent sputtering operation the sputtering surfaces of the target would be physically roughened by the physical removal of particles of target material which occurs during sputtering, as evidenced by Hurwitt (col

3 lines 53-55: sputtering by plasma roughens target surface; col 6 lines 59-64: roughening of target inherent during sputtering process; abstract: target inherently roughened by sputtering process). Therefore, the target of Subramani in view of Yamakoshi will inherently have a surface roughness of the inner bottom face be less than the roughness of the cylindrical peripheral space once the peripheral face is used for sputtering.

5. Claims 11-13 and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Subramani in view of Pavate, as applied to claim 1 and 9 above, and further in view of Buehler (US 2002/0079217).

As to claims 11 and 16, Subramani discloses a hollow cathode sputtering target where the target has an outer peripheral edge that is part of the non-erosion portion of the target (figure 1A: showing target shape with inner peripheral faces 4 and 6, and oppositely outer peripheral faces [unlabeled], but is silent as to these surfaces being rough.

Buehler discloses a sputtering target treatment in which peripheral areas of the target are roughened by imprints (abstracts). The roughening of these regions is disclosed as reducing the flaking of material from surfaces in the sputtering chamber (paragraph 6 and 7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to roughen the outer periphery of the target, as disclosed by Buehler, in the apparatus of Subramani in view of Pavate, because the roughened

surface prevents material from flaking off onto the substrate (Buehler at paragraph 6 and 7).

As to claims 12 and 17, the method of forming the device is not germane to the issue of patentability of the device itself. Therefore, the limitation of "abrasive blasted" has not been given patentable weight. These claims therefore fall within the disclosure of Subramani, Pavate and Buehler.

As to claims 13 and 18, Subramani discloses the target is made from a cladding material (claim 2: materials to form sputtering layer).

6. Claims 11-13 and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Subramani in view of Yamakoshi, as applied to claim 1 and 9 above, and further in view of Buehler (US 2002/0079217).

As to claims 11 and 16, Subramani discloses a hollow cathode sputtering target where the target has an outer peripheral edge that is part of the non-erosion portion of the target (figure 1A: showing target shape with inner peripheral faces 4 and 6, and oppositely outer peripheral faces [unlabeled], but is silent as to these surfaces being rough.

Buehler discloses a sputtering target treatment in which peripheral areas of the target are roughened by imprints (abstracts). The roughening of these regions is disclosed as reducing the flaking of material from surfaces in the sputtering chamber (paragraph 6 and 7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to roughen the outer periphery of the target, as disclosed by Buehler, in the apparatus of Subramani in view of Yamakoshi, because the roughened surface prevents material from flaking off onto the substrate (Buehler at paragraph 6 and 7).

As to claims 12 and 17, the method of forming the device is not germane to the issue of patentability of the device itself. Therefore, the limitation of "abrasive blasted" has not been given patentable weight. These claims therefore fall within the disclosure of Subramani, Yamakoshi and Buehler.

As to claims 13 and 18, Subramani discloses the target is made from a cladding material (claim 2: materials to form sputtering layer).

7. Claims 7, 24 and 32 rejected under 35 U.S.C. 103(a) as being unpatentable over Subramani in view of Yamakoshi and Kulkarni (US 6,283,357. Additional evidence is provided by Hurwitt (US 5,632,869).

As to claim 7, Subramani discloses a hollow cathode sputtering target comprising an inner bottom face (figure 1: target face 5) that forms a non-erosion portion of the hollow sputtering target and a cylindrical inner peripheral face (figure 1A: target face 6) that forms an erosion portion of the hollow cathode target. Subramani also discloses the machining to provide a smooth target surface (paragraph 34).

Subramani discloses 'machining' the target surface, but is silent as to the exact method of creating a smooth target surface including polishing and etching and the

roughness being less than 1 um. Subramani is also silent as to the creation of the target by plastic working.

Yamakoshi discloses a method of finishing the surface of a target by polishing and etching the face of the target to form a roughness of 1 um or less to prevent nodule formation (col 4 lines 10-24).

Kulkarni discloses a method of forming a hollow clad target in which the target is formed into the desired shape by punching, rolling, or stretch forming (col 2 lines 35-38). The formation method of Kulkarni is disclosed as forming a less expensive target with higher utilization (abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use polishing and etching, as disclosed by Yamakoshi, in the method of Subramani, because the polishing and etching helps to prevent nodule formation. Additionally, it would have been obvious to one of ordinary skill in the art at the time of the invention to form the target by plastic working, as disclosed by Kulkarni, because this forms a less expensive target with higher target utilization during sputtering.

As to claim 24, Yamakoshi discloses the roughness of the target face is less than 0.5 um during the polishing and etching step (col 4 line 17; claim 2: 0.2 um roughness).

As to claim 32, Subramani in view of Yamakoshi and Kulkarni discloses a polished target in which the entire target has an equally low surface roughness before use. However, it would be inherent that during any subsequent sputtering operation the sputtering surfaces of the target would be physically roughened by the physical removal

of particles of target material which occurs during sputtering, as evidenced by Hurwitt (col 3 lines 53-55: sputtering by plasma roughens target surface; col 6 lines 59-64: roughening of target inherent during sputtering process; abstract: target inherently roughened by sputtering process). Therefore, the target of Subramani in view of Yamakoshi and Kulkarni will inherently have a surface roughness of the inner bottom face be less than the roughness of the cylindrical peripheral space once the peripheral face is used for sputtering.

Response to Arguments

8. Applicant argues in the remarks that Subramani does not disclose a cup-shaped body as Subramani's target structure is an annular/trough shaped design. However, as shown in figure 1B of Subramani, the target of Subramani is cup shaped in cross section (as compared to cup shape of instant invention at figure 1). The consisting of language does not appear to preclude the target of Subramani as the entire target of Subramani is cup shaped in cross section.

9. Applicant additionally argues that Subramani does not contain the required 'non-sputtering' portions of the target surface and cites portions of Subramani that indicate the bottom well portion of the target is composed of sputter material. The is no indication in the instant claims that the non-sputtered regions are not constructed of the same material as the sputtered regions. Additionally, the regions of the target which are sputtered are controlled by the magnets, which in turn control the plasma (Subramani at figure 1b: showing magnetic fields for plasma control). The magnets of Subramani

appear to be directing the field in the directions of the sidewalls (figure 1b). Additionally, one of ordinary skill in the art would recognize that all components in a plasma chamber will be exposed to plasma and etched or sputtered to some extent. It is therefore unclear why the bottom portion of Subramani's target is considered a sputtered region while the similarly shaped target of the instant invention is considered to have a non-sputtered region in the same location.

10. Applicant further argues that the current amendment, including claim language of 'upon manufacture' precludes the current rejections which rely upon features present after sputtering has been performed. This argument is not found persuasive in the apparatus claims because the method of forming the device is not relevant to the patentability of the device itself – only the resulting structural features are given patentable weight. Additionally, this argument is not found persuasive with respect to the method claims because the argument appears to be one of terminology. It is not clear why one cannot consider the beginning sputtering steps of the prior art, or even a cleaning step before actual processing, as well known in the art, can not be considered as part of the manufacturing process. There appears to be no set boundaries as to when 'manufacturing' occurs and at what point in the target's lifetime manufacturing is occurring or complete.

11. Applicant argues in the remarks that Buehler is not applicable because Buehler teaches away from the current invention. Buehler is currently relied upon for the rejection of instant claims 11 and 16, among others. Claims 11 and 16 require a "rough

face." Applicant's arguments that the teaching of a roughened non-sputtering surface teaches away from the smoothing of other surfaces is therefore not found persuasive.

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason M. Berman whose telephone number is (571)270-5265. The examiner can normally be reached on M-R 8am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571)272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nam X Nguyen/
Supervisory Patent Examiner, Art Unit 1753

/J. M. B./
Examiner, Art Unit 1795
7/19/2010